



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Reply To
Attn Of: WCM-121

Mr. William Ernst
Company Energy & Environmental Affairs
The Boeing Company
P.O. Box 3707
MC 7A-WW
Seattle, WA 98124-2207

**Re: Transformer PCB Investigation Plan
Boeing Plant 2, Seattle/Tukwila, Washington
EPA ID No. WAD 00925 6819
RCRA Docket No. 1092-01-22-3008(h)**

FILE COPY

Dear Mr. Ernst:

This letter provides the United States Environmental Agency (EPA) comments on the draft Transformer PCB Investigation Plan (WESTON June 2002). In our review EPA considered time and cost efficiency with respect to this investigation. As a result, some of our comments call for additional data collection that we believe will be necessary in subsequent phases of the project, such as information on the bank material or the groundwater flow in the investigated area. EPA strongly believes in minimizing the number of field mobilizations if they can be avoided through proactive management.

EPA also recognizes that much of Boeing's proposed investigation will be conducted on the Jorgensen Forge property. EPA has met with Jorgensen Forge and will be negotiating with them to conduct additional investigatory work to determine if releases to the Duwamish Waterway have occurred from the Jorgensen Forge property.

Our comments are provided in the enclosure to this letter. Pursuant to Section X of the 1994 Administrative Order on Consent, Boeing shall revise the subject document responsive to all enclosed comments. The revised document shall be submitted to EPA for review and approval within thirty (30) days of receipt of this letter.

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INTRODUCTION

In November 2001, The Boeing Company (Boeing) informed the U.S. Environmental Protection Agency (EPA) of their planned replacement of secondary containment curbing on the southern portion of Plant 2, which is immediately adjacent to the transformer equipment owned and operated by Seattle City Light (Transformers). Soil samples collected during the excavation revealed the presence of PCBs, up to 460,000 micrograms per kilogram ($\mu\text{g/kg}$). EPA determined that the PCBs in this area have the potential for migration in both vertical and horizontal directions and that previously collected data do not adequately characterize the extent of contamination. Therefore, Boeing was directed to prepare and submit a work plan for the PCB investigation at the Transformers (PCB work plan) in an EPA letter dated May 23, 2002.

GENERAL COMMENTS

In general, the proposed PCB work plan does not fulfill the requirements stated in the EPA letter dated May 23, 2002. The requirements of the PCB work plan are as follows:

- Characterize the hydrogeologic regime underlying the study area
- Gather data necessary to make decisions on stabilization
- Characterize concentrations, rates and directions of movement, and chemical nature and extent of contamination in any environmental medium
- Identify potential human and ecological receptors to hazardous constituents at or from the facility
- Support the development and analysis of corrective measure alternatives

The PCB work plan was to describe available data to be used, additional data to be collected, and methodology to be used in assessing potential risk to human health and to assess potential environmental impacts. One of the main weaknesses of the PCB work plan is the lack of a clear strategy to adequately characterize current site conditions. Boeing repeatedly refers to facility-wide data collected during the

RFI as sufficient to meet the site-specific requirements of the investigation, although few soil samples were taken on the Jorgensen Forge property and groundwater flow was not characterized, specifically, south of the Plant 2 boundary during the RFI. In addition, general deficiencies of the PCB work plan are as follows:

1. Lack of historical documentation of potential sources and contaminant migration pathways
2. Inadequate descriptions of sampling procedures
3. Insufficient soil, sediment, and groundwater sampling locations
4. Inadequate quality assurance project plan (QAPP)

These general deficiencies are discussed in detail in the specific comments on the PCB work plan found below.

SPECIFIC COMMENTS

SECTION 2.0, BACKGROUND

1. In the first paragraph on page 2-1 Boeing refers to a soil sample having a PCB concentration of 460,000 $\mu\text{g/kg}$, the location of which is not found in the PCB work plan. The presentation of background data must include a summary of historical data collected at the site and should be represented in figures and tables. See general deficiency 1.
2. In the first paragraph on page 2-1 the Transformers' location is described using Figure 1, which only shows the location with respect to the entire facility. Boeing should include an additional, more detailed figure to show the excavation that prompted this current investigation, and any visual observations that may explain the observed distribution of contamination (such as cracks in the transformer pad, sumps, piping, dry wells, and any utility lines). See general deficiency 1.

3. The first paragraph on page 2-1 states that Boeing will only investigate the area immediately adjacent to the Transformers. The sediment investigation should extend west to the navigation channel in the Duwamish Waterway and upland soil borings and groundwater sampling should extend as far to the north, south and east as PCB contamination is encountered. The bank investigation should extend as far south as PCBs are detected. See general deficiency 3.
4. In the second paragraph on page 2-1, Boeing discusses the potential migration of PCBs in the vertical and horizontal directions. Existing sediment data should be discussed to provide appropriate context for sediment cleanup decisions. See general deficiency 1.
5. In the last paragraph on page 2-1, Boeing states that EPA approved the fate and transport modeling (Weston 2000) as part of the Corrective Measure Study (CMS). The upland unit fate and transport modeling work being conducted by Boeing is irrelevant to this investigation because the modeling is not focused on the PCB contamination in this area. In addition, Appendix C of the fate and transport work plan which describes the model boundary dimensions and constituents of concern was not approved, as stated in the EPA letter dated October 19, 2000. This paragraph must be deleted in its entirety from the final document.

SECTION 3.0, PROJECT MANAGEMENT PLAN

6. Boeing lists consultants involved in the Boeing Plant 2 project in section 3.1.2 on page 3-1 but do not clearly indicate the lead or contact person for the investigation planning, data analysis, or field collection activities. Boeing should clearly define the roles and responsibilities of personnel involved with the project.

SECTION 4.1, INTRODUCTION

7. The third bullet on page 4-1 refers to characterizing the concentration and chemical nature of contamination in any environmental medium; however, the work plan does not list analytes, methods, or data quality objectives, only cross-references to other documents are provided. The

analyte list for each environmental media, along with methods and data quality objectives, must be provided in the work plan. See general deficiency 2. In addition, it may be proactive to analyze sediments for the same list of chemicals as the Lower Duwamish Waterway investigation, including polyaromatic hydrocarbons (PAH), phthalates, and metals, to support future efforts to determine the extent of contamination in the Duwamish Waterway. EPA will likely collect split samples and analyze for the same list of contaminants as the Lower Duwamish Waterway investigation.

SECTION 4.2, AVAILABLE DATA

8. The first bullet on page 4-1 states that sufficient data are available from the RFI and CMS monitoring to characterize the hydrogeologic regime underlying the study area. The RFI and CMS monitoring characterized the facility-wide hydrogeologic characteristics at Plant 2. This investigation requires a current, location-specific characterization of the hydrogeologic regime that focuses on local groundwater flow patterns. Therefore, Boeing must remove this statement and propose additional evaluation of existing data and/or newly collected data to meet the objective. See general deficiency 3.
9. The second bullet on page 4-1 states that sufficient data are available from the RFI and CMS monitoring to gather data necessary to make decisions on stabilization in most of the study area. Again, the RFI and CMS monitoring characterized other RCRA units and the facility-wide characteristics at Plant 2, while this investigation requires a current, location-specific characterization. Boeing must remove this statement and propose additional data collection to meet the objective. See general deficiency 3.
10. The third bullet on page 4-1 states "The characterization of concentrations, chemical nature and extent of contamination in any environmental medium off-site or on-site, including sediment in the Duwamish Waterway has been completed" This statement is not merely inaccurate but not relevant to the investigation of the most recently discovered PCB release and gives the impression that EPA has somehow reversed itself on previous decisions, rather than focusing on

the fact that new data resulted in a need for further investigation. Boeing later states that the data were considered sufficient for EPA to approve the CMS fate and transport modeling (Weston, 2002) in the area around the Transformers. In fact the CMS fate and transport modeling (Weston, 2002) has not been reviewed by EPA, and the model boundaries of the larger area around the transformers from Appendix C of the fate and transport modeling work plan (Weston, 2000) have not been approved. Boeing must remove both of these statements from the PCB work plan. See general deficiency 1.

11. The first bullet on page 4-2 states that the goal of identifying potential human and ecological receptors to hazardous constituents at or originally from the "Capitol Transformer" has been completed with available data (Weston 1998) and that additional data collection is not required. The recently discovered PCB release prompted this investigation and the collection of new data. Therefore, potential human and ecological receptors must be reevaluated using current data. Boeing must remove this statement from the PCB work plan. In addition, the term the "Capitol Transformer" must be defined. See general deficiency 1.

SECTION 4.3, DATA TO BE COLLECTED

Soil Sampling

12. Given the probability that storm drains are preferential pathways, soil sampling locations near the fence line must be modified by increasing the sampling density, including samples along the bottom and sidewalls of the storm drains upgradient and downgradient of the Transformers. Toward this end, the PCB work plan has to document all storm drains, utility lines, and outfalls at or downgradient of the Transformers and sampling locations to assess these potential preferential pathways. See general deficiencies 1 and 3.
13. EPA recommends using a statistically based sampling grid because one of the objectives for this investigation is to determine whether highly contaminated areas (hot spots) are present over an area where the mechanism of PCB migration and source area are not sufficiently characterized.

A triangular, square, or rectangular sampling grid is typically used to determine the probability of hitting a hot spot of a specified size with a specified confidence level (Gilbert 1987). This approach will provide a framework for better decision making regarding potentially affected areas requiring remediation or removal. The grid spacing should be determined based on current and future land use scenarios and on the suspected likelihood of hot spots being present. A narrower grid spacing interval should be used in areas near suspected hot spots, suspected preferential pathways, and suspected sources. Boeing must include the rationale and technical basis for the currently proposed soil sampling grid spacing in the PCB work plan. See general deficiency 2.

14. On page 4-2 Boeing proposes sampling soil at the surface and continuously with analyses at 2.5 foot intervals to a total depth of 15 feet. Boeing proposes to analyze all samples within the "immediate vicinity" of the transformers for PCBs, while samples beyond the "immediate vicinity" will be analyzed if PCBs are present in the "immediate vicinity." The PCB work plan does not describe the method to determine the presence of PCBs in the "immediate vicinity" before moving to the next sampling location or sampling depth. Boeing must describe in detail the decision process for sampling soil including the criteria used to decide the presence of PCBs. In addition the term "immediate vicinity of the transformers" must be defined, preferably in measurable mathematical terms. See general deficiency 2.
15. Soil samples SB-07207 and SB-07210 show contamination as deep as 11.5 feet, but no samples are proposed to the south or east to define the lateral extent. Boeing must include additional sampling to adequately define the extent of PCB characterization in this area. See general deficiency 3.
16. Several existing samples (SB-07207, SB-07210, and PL2-006A) show contamination at the lowest depth interval; therefore, a total depth of 15 feet below ground surface (bgs) may not be a sufficient depth from which to collect soil samples to establish the extent of contamination. Boeing must increase the total sampling depth based on soil sampling results. See general deficiency 3.

17. Boeing proposes to analyze 5 percent of the soil samples for organic carbon. Boeing should analyze all soil and sediment samples for total organic carbon (TOC). That will assist in evaluating whether the PCB contamination is in an oil phase and mobile, and additionally to assess whether it is bio-available. See general deficiency 2.
18. The text does not describe if individual Aroclors will be analyzed. Boeing must analyze all soil, bank, and sediment samples for individual Aroclors as well as Total PCB. In addition, all sediment samples must include a grain size analysis for use in evaluation of PCB contamination patterns in the sediments and the assessment of sediment deposition and erosion. See general deficiency 2.

Bank and Sediment Sampling

19. The discussion of data to be collected on page 4-2 does not include a description of bank sampling methodology. Bank sampling is similar to soil sampling and must be sampled as continuous cores and analyzed at 2.5 ft intervals. Total depth of bank sampling must extend to the native geologic unit. Boeing must also include a detailed description of the bank sampling locations and collection methods. If contamination is discovered at the southern most sample, additional bank samples to the south should be collected. See general deficiency 2.
20. The locations of the proposed sediment samples are not adequately described, either horizontally or vertically. The proximity of proposed samples to existing stations in the lower Duwamish Waterway must be provided in an additional figure. Boeing must specify the depth intervals of the sediment samples and take samples from the surface to address the regulatory compliance interval of 0 to 0.3 ft (i.e., the top 10 cm), and to provide comparable data for interpretation of nearby patterns. It is important to recognize patterns and possible contiguity with PCB concentrations in the DSOA.

Boeing must adjust its 4 uppermost composites to conform with the Southern DQO approach (0-0.3, 1-2, 2-4, and 4-6 ft BSS), and increase its intervals to 3 ft on the bottom two composites (i.e.,

6-9 ft and 9-12 ft) to provide data that will be easily interpretable against the nearby data sets.

This is the same number of composite samples that Boeing proposed. Also, Boeing must specify what basis will be used for stopping analysis in lower composites. To characterize risk to aquatic organisms, sediment samples must be taken from intervals to at least 12 ft BSS. See general deficiencies 1 and 2.

21. The proposed sediment sampling locations may not adequately determine the extent of contamination in the Duwamish Waterway. EPA requests sediment sampling be conducted at 50 foot intervals to the navigation channel or centerline of the waterway.

In addition, sediment sampling locations should be identified at or near outfall locations and should be added to the south of the proposed locations at 50 foot intervals until PCB concentrations fall below the Sediment Management Standards (SMS). See general deficiency 3

22. Since the Jorgensen shoreline is contiguous with the southwest yard, EPA recommends analyzing for RCRA metals in the soil samples proposed on the bank and the proposed sediment samples. EPA will likely take split samples and analyze for RCRA metals during field work oversight.

Groundwater Sampling

23. Groundwater sampling procedures from the 1994 RFI work plan (Weston 1994) are not consistent with the low-flow well sampling procedures recently used for the groundwater monitoring for sediment cap impact evaluation and upland area groundwater monitoring. The 1994 RFI work plan was amended by a 2001 QAPP addendum for groundwater sampling (Weston 2001) that describes low-flow sampling procedures. Boeing must follow groundwater sampling procedures in the 2001 QAPP addendum (Weston 2001) to provide groundwater data comparable to that of recent sampling at Plant 2 and reference the 2001 QAPP addendum in the work plan. See general deficiency 2.

24. The 2001 QAPP addendum states that turbid samples will be centrifuged prior to extraction; however, centrifuging will remove suspended particulates and bias results. If low-flow well sampling procedures are used, turbidity should be reduced, thereby eliminating the need for centrifuging. Reporting of PCBs in groundwater on both a whole water (unfiltered, uncentrifuged) basis and as dissolved concentrations is preferable; however, if only one analysis is performed, the whole water sample results must be reported. See general deficiency 2.
25. Page 4-2 of the PCB work plan states that dissolved organic carbon (DOC) will be analyzed along with PCBs in all groundwater samples. For groundwater, TOC has typically been analyzed (Weston 1994). Groundwater must be analyzed for TOC to provide comparability with previous groundwater investigations. See general deficiency 2.
26. The number of wells proposed for groundwater sampling should be increased. RFI data characterized general groundwater flow over the entire facility, but did not include sufficient data south of Plant 2 on the Jorgensen Forge property. This investigation requires a current, location-specific evaluation of groundwater flow pattern as well as an evaluation of the extent of PCB contamination in groundwater. Additionally, sampling for PCB concurrently with other chlorinated volatile organic compounds (VOCs) in this area would be beneficial to this PCB investigation to assess the mechanisms of PCB transport through groundwater (colloidal transport or NAPL migration) and the potential of PCB migration associated with solvent plumes. In addition to the three wells proposed for chemical sampling, two existing upgradient wells (PL2-027A and PL2-005A) should be sampled and four new wells should be installed in the A-aquifer at the following locations:
- West of the Transformers between proposed soil borings SB-07217 and SB-07221. This location is directly downgradient from the location where the highest PCB concentration was detected during the curbing excavation and will help define the extent of contamination in the suspected source area.
 - South of the Transformers in the area bounded by proposed soil borings SB-07226, SB-07221, and SB-07224. This location is near the soil boring where PCBs were detected up to 11.5 feet bgs (SB-07207) and will help define the extent of contamination in the suspected source area.

- West of the Transformers in the area bounded by proposed soil borings SB-07233, SB-07236, and SB-07232. This location will help define the extent of the groundwater contamination toward the waterway.
- Along the shoreline in the areas bounded by proposed soil and bank borings SD-SWY-17, SB-07243, and SB-07242. This location will help define the extent of groundwater contamination toward the waterway.

27. One of the objectives of this investigation is to characterize the hydrogeological regime underlying the study area, which includes collecting hydrogeologic data to assess the current hydrogeologic conditions. The following elements must be included in the investigation:

- Extension of the monitoring well network for water level measurements (include wells PL2-030A and PL2-007A)
- Evaluation of tidal effects if significant
- Determination of aquifer hydraulic parameters
- Determination of the effects of storm drains on shallow groundwater and any other preferential pathways above or below the water table.

4.4 INVESTIGATION DERIVED WASTE

28. Boeing states that waste will be handled in accordance with Boeing protocols. These protocols must be described and references to the appropriate documents must be included. Further, presumably Boeing protocols satisfy all existing regulatory requirements, however it must be emphasized that meeting all existing regulatory requirements is the criterion, and Boeing protocols literally apply to Boeing in its conduct of non-regulatory activities. See general deficiency 2.

FIGURES

29. Figure 1, Boeing Plant 2 Facility Map, identifies an orange polygon to the west of the transformers and pad as the "area of interest," but none of the proposed sampling locations are within this area. An additional figure, at a smaller scale, should be included in the work plan showing the "area of interest" and the specific location of the transformers, condition of the transformers and surrounding area, and location of all utility lines, storm drains, and outfalls. See general deficiency 1.
30. Figure 2, Existing Sample Locations and Data, does not adequately describe historical data (see general deficiency 1). The following must be included:
- Definition of the reference concentration (that is, total PCB or individual Aroclors)
 - Definition of data qualifiers
 - A data table listing concentrations, locations, and sampling depths
 - All historical soil samples including those collected during the curbing excavation

APPENDIX A, QUALITY ASSURANCE PROJECT PLAN

31. Based on a review of the QAPP and associated work plan, determining if the proposed analytical methods and sampling approach are adequate for achieving the project objectives is not possible because the sampling rationale and sampling design are not adequately defined. EPA has developed a seven-step data quality objectives (DQO) process (EPA 2000b) so that project objectives are adequately defined and that collected data will be appropriate to meet the objectives. Application of the DQO process for this project would help resolve outstanding issues identified in the work plan comments and must be implemented. See general deficiency 4.

32. Several required QAPP Elements specified in guidance (EPA 1998, 2001) are not included in the QAPP or work plan or are inadequately described (see general deficiency 4). These include the following:

- Approval sheet
- Distribution list
- Data quality objectives and performance criteria.
- Sample process design (experimental design).
- Field quality control requirements.
- Sample container requirements, preservatives, and holding times
- Data validation requirements
- Laboratory certification requirements.

A full discussion of all the above items must be included in the revised version of the QAPP.

Section 2.1, Distribution List

33. The QAPP should specify the contact person, provide the telephone number or e-mail address, and discuss each person's role and responsibilities for each organization involved in the project including the regulatory agencies. A figure that shows the hierarchy of management and the lines of communication should also be included.

Section 2.2, Project/Task Organization

34. The laboratory performing the work should be specifically identified in Section 2.2.2, Roles and Responsibilities. The laboratory must be certified to perform the PCB analyses in all media (sediment, groundwater, and soil). In addition, laboratory certification requirements must be summarized in the QAPP.

Section 2.4, Quality Objectives and Criteria for Measurement Data

35. On page 2-2 of the QAPP, the text states that the EPA DQO process was followed in development of the QAPP. Based on review of the QAPP and work plan, the DQO process was not implemented. Boeing must follow and implement the DQO process.
36. On page 2-2 of the QAPP, the text states that the measurement quality objectives for the project will follow those specified in the 1994 RFI QAPP. Measurement quality objectives from the RFI are not necessarily suitable. Project-specific measurement quality objectives must be developed following the DQO process.

Section 3.1, Sampling Process Design (Experimental Design)

37. The complete sampling program for this investigation should be accurately summarized. Monitoring well samples should be included in the sampling program summary. An additional table should be prepared that summarizes the number of soil, groundwater, and sediment samples for each analysis. The type and approximate number of QA samples including trip blanks, equipment rinsate blanks, ambient condition blanks, field duplicates, and matrix spike/matrix spike duplicates should also be summarized.

Section 3.2, Sampling Methods Requirements

38. Section 3.2.3, Investigation Derived Wastes, must include a summary of the frequency and sample analyses for investigation-derived waste.

Section 3.10, Data Management

39. On page 3-10 it is stated "GIS data are collected as required by a given project." GPS technology must be used to locate all sediment, soil, and bank samples and input into GIS with the other required data. In addition, any new well must be surveyed and input into GIS and sediment data must be submitted to EPA and Ecology in SEDQUAL format.

Section 4.4, Data Review, Validation, and Verification Requirements

40. The text states that Weston will perform validation of the chemical data collected under this investigation. The data must be validated by a qualified independent third party.

Section 4.5, Validation and Verification Methods

41. The percentage of laboratory data packages that will undergo full and cursory data validation should be described. Full validation includes a complete review of raw analytical data and supporting documentation and is commonly performed for about 20 percent of the analytical data packages. A more cursory review based on data summaries is typically performed on the remaining data packages. The specific laboratory internal quality control information that will be evaluated under full and cursory data validation should be summarized.

Section 5, References

42. References to Frontier Hard Chrome documents are not applicable and should be removed.

Table 1, QA/QC Analytical Summary and Fixed Laboratory Analytical Method, Boeing Plant 2 Transformer Pad Excavation, Tukwila, Washington

43. This table provides a QA/QC summary for the Transformer PCB investigation plan rather than a transformer pad excavation. The title must be corrected.
44. QA/QC information for sediments must be included in the table. PCB analytical method requirements specified by (Pentec 2001) should be used for this investigation.
45. Applicable proposed media cleanup levels and sediment screening criteria must be included in the table so that the adequacy of proposed detection limits can be evaluated.

46. The table should clearly specify if the "detection limits" represent the required detection limits or quantitation/reporting limits. If they represent detection limits, the proposed levels are much higher than can be achieved using EPA method 8082. If they represent quantitation limits, the proposed quantitation limits for PCB for soil ($67 \mu\text{g/kg}$) is above the PMCL for soil ($33 \mu\text{g/kg}$). Boeing must confirm that these are the lowest quantitation limits for soil that can be attained and modify the analytical requirement accordingly.
47. The accuracy and precision requirements are less stringent than commonly met by some local commercial laboratories. For water, the proposed accuracy (30 to 160 percent) and precision (± 30 percent) are not sufficiently rigorous. In Seattle based laboratories, the accuracy requirement is typically about 30 to 125 percent and the precision requirement is typically ± 25 percent. The accuracy requirement for water should be changed and the precision requirement for soil and groundwater should also be changed from ± 30 percent to ± 25 percent.

REFERENCES

- EPA. 1998. EPA Guidance for Quality Assurance Plans (QA/G-5). U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/R-98/018. February.
- EPA.. 2000a. Letter to R. Rogers from A. Filutowski. U.S. EPA Region 10, Seattle, Washington. October 19, 2000.
- EPA. 2000b. Guidance for the Data Quality Objectives Process (QA/G-4). U.S. Environmental Protection Agency, Office of Environmental Information. EPA/600/R-96/055.
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Weston 1998. "Comprehensive RCRA Facility Investigation Report, Boeing Plant 2, Seattle/Tukwila, Washington." Prepared for The Boeing Company. August.

Weston 2000. "Fate and Transport Modeling Work Plan, Boeing Plant 2, Seattle/Tukwila, Washington." Prepared for The Boeing Company. December 2000.

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 RCRA File XX

CONCURRENCES				POLICY FILE	
Initials	AP	<i>[Signature]</i>			Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Name:	Anna Filutowski OWCM, RCU	Howard Orlean OWCM CA Coordinator	Charles Ordine ORC		If policy file please bcc to RMSPU Manager
Date:	9/12/02	9/12/02			
RCRAInfo EVENT		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		
SNC IDENTIFICATION		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		
(Can it be entered in RCRAInfo?)		Yes <input type="checkbox"/>	No <input type="checkbox"/>		
SBREFA INFO VERIFICATION		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>		
PEER REVIEW		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		